Remarks

Claims 1, 3-4, 6-7, 9-27, 37 and 43-46 are pending in this application. Applicants request reconsideration of this application in view of the foregoing amendments and following remarks.

I. Rejection of Claims 1, 9-13, 15-20, 23-26, 37 and 43-45

Claims 1, 9-13, 15-20, 23-26, 37 and 43-45 are rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Norris *et al.*, U.S. Patent No. 4,869,421 (Norris). Applicants traverse this rejection and request that it be withdrawn.

Applicants have amended independent claim 1 to include several additional features that further distinguish applicants' invention from the cited documents. For example, applicants have amended the preamble of independent claim 1 to concern microfluidic structures. Support for this amendment can be found throughout the application, such as at page 2, beginning at line 18; FIGS. 21-25, and 28, and the associated text; page 27, lines 9-16; and Example 8. One primary application of the method recited in independent claim 1 is useful for forming microfluidic structures, where the end device has features on the micro scale. Such features can be incorporated into a monolithic device by providing plural lamina, registering the lamina in an order that corresponds to producing features, such as microchannels, and then bonding such lamina together to form a desired device. Norris does not teach or suggest a microlamination process for forming a microfluidic device. Instead, Norris teaches processes that are useful for forming macroscopic devices. For this reason alone, the rejection of independent claim 1 over Norris should be withdrawn.

Applicants also have amended independent claim 1 to state "forming a ductile, patternable intermetallic foil by roll compaction of elemental powder." Support for this amendment can be found at page 17, line 14; and in Example 11. At the time of the Norris patent, *ductile* intermetallics were not known. One of the primary problems associated with using intermetallics as the present invention was being developed was that such materials were too brittle to be patterned; brittle intermetallics often fail when they are being machined or otherwise processed. Thus, as of the filing date of Norris, it was not possible to prepare materials that were sufficiently ductile to allow formation of patternable laminae of sufficiently thin cross section to be useful for producing microfluidics according to the processes disclosed in the present application. Support for this contention can be found in Deevi *et al.*, "Processing,

Properties, and Applications of Nickel and Iron Aluminides," *Progress in Materials Science, 42 pp. 177-192 (1997).* According to this reference:

> Many intermetallic compounds exhibit brittle fracture through transgranular cleavage and intergranular separation, and the brittle fracture of low crack tolerance has been the primary barrier to the use of intermetallic compounds for load-bearing applications.

As currently understood by applicants, at the time of Norris there was no known route useful for making in, intermetallic laminae having sizes useful for making microfluidic devices by a microlamination process. The present invention satisfies that need. For this additional reason, the process as recited in independent claim 1 is not anticipated by Norris.

Finally, applicants have amended independent claim 1 to state particular processes by which laminae are patterned. These features were presented in claim 14 as originally filed, and hence no new search should be required in view of applicants' requested amendment. Norris does not teach patterning laminae. Norris refers to a honeycomb core, but provides no guidance concerning how such core is made, and there is absolutely no suggestion in Norris that such core was made using a laminae patterning and registration process as with the process of independent claim 1. Moreover, the particular patterning processes now recited in independent claim 1 are not taught by Norris.

Claims 9-13, 15-20, 23-26, 37 and 43-45 depend, either directly or indirectly, from independent claim 1. These are allowable for the reasons stated above concerning claim 1, and further in view of the patentable combinations of features recited in these claims.

For example, claim 10 states that the titanium aluminide is Ti_3Al. This particular intermetallic species is not taught by Norris.

Claim 11 states that the bonding material is positioned between a first intermetallic lamina and a second intermetallic lamina. Norris teaches a honeycomb core, which is not a lamina, and does not teach two intermetallic structures.

Claim 15 states "procuring a patterned lamina or lamina blank." Norris does not teach using patterned laminae.

Claims 16-22 and 24 concern features associated with providing an additional intermetallic material, wherein the intermetallic is formed by processing substantially pure

metals. Norris does not teach processing such laminae to produce an additional intermetallic material.

II. Rejection of Claims 3-4, 6-7 and 14

Claims 3-4, 6-7 and 14 are rejected as allegedly being obvious over Norris in view of Deevi *et al.*, U.S. publication No. 2002/0085941 (Deevi). Applicants traverse this rejection and request that it be withdrawn.

The rejected claims depend directly from independent claim 1. The differences between independent claim 1 and Norris are discussed above. Deevi does not cure the deficiencies of Norris relative to teaching the features of independent claim 1.

For example, the preamble of claim 1 makes it clear that the process is suitable for making a microfluidic product by a microlamination process. Deevi provides no teaching of making a microfluidic, and provides no teaching of using a microlamination process. Since Norris does not teach these features, the combination of Norris and Deevi also cannot teach or suggest these features.

Norris does not teach or suggest patterning a patternable intermetallic lamina in a microlamination process. Deevi teaches one method for making a ductile intermetallic lamina, but provides no suggestion to pattern a lamina, particularly patterning using the specifically recited patterning techniques now recited in independent claim 1. Thus, the combination of Norris and Deevi also cannot teach or suggest this feature of independent claim 1.

Because claims 3-4, 6-7 and 14 depend directly from independent claim 1, such claims are allowable for the same reasons stated for claim 1, and further in view of the patentable combinations of features recited in these claims.

The Office action states, with reference to claim 14, which has been canceled and the features thereof added to independent claim 1, that Deevi teaches laser cutting and mechanical stamping as common techniques for patterning intermetallic sheets. However, paragraph 52 of Deevi as referred to by the Office action makes it clear that, once again, this is for a macroscopic device, not a microfluidic device.

III. Rejection of Claims 21 and 22

Claims 21 and 22 are rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Norris in view of Johnson, U.S. patent No. 3,444,925 (Johnson). Applicants traverse this rejection and request that it be withdrawn.

The portion of Johnson cited by the Office action to support the rejection states that corrugating rolls are used to form corrugations. Again, as with the other references cited against this application, this refers to a process useful for making products having substantially larger dimensions than are found in a microfluidic device. That is, corrugating rollers *cannot* be used to make structures, such as microchannels, useful for forming a microfluidic device by a microlamination methodology. Thus, even if the documents cited against this application would be combined in the manner alleged, they still would not be useful for patterning laminae for making a microfluidic device by a microlamination process.

IV. Rejection of Claim 27

Claim 27 is rejected as allegedly being obvious over Norris and view of Betta *et al.*, U.S. Patent No. 5,512,250 (Betta). Applicants traverse this rejection and request that it be withdrawn.

The Office action contends that Norris teaches all features of independent claim 1. This is incorrect, as established above. Betta is cited solely for teaching associating a catalyst with a structure. However, Betta does not cure the deficiencies of Norris relative to teaching the features of independent claim 1. As a result, the combination of Norris and Betta also cannot teach or suggest the features of independent claim 1, from which rejected claim 27 depends. Applicants therefore request that the rejection of dependent claim 27 be withdrawn.

V. "Patterning Reads on Corrugating a Honeycomb Sheet

Page 7 of the Office action states that, although applicants' prior arguments were fully considered, "the claim language does not distinguish from a method of making an intermetallic honeycomb structure as the claimed patterning reads on corrugating a honeycomb sheet." Applicants first note that one would not corrugate a honeycomb core. Despite this seeming misstatement, such comment also misconstrues applicants' claims to concern production of macroscopic devices, as opposed to microfluidic devices. The differences between macro, meso and micro devices are discussed in the Background section of the present application. And this

distinction is not simply one associated with decreasing size. Instead, techniques that might be useful for making a macroscopic device, such as is taught by the references cited against the present application, simply are not applicable to making microfluidic devices having features much smaller than are present on a macroscopic device.

Furthermore, so that the claim language clearly distinguishes corrugation, applicants' have amended independent claim 1 to state "patterning the patternable intermetallic lamina to form a NON-CORRUGATED patterned intermetallic lamina." An understanding of applicants' disclosed invention will establish that corrugating a macroscopic device is not what applicants are claiming in the present application.

The present application is in condition for allowance, and such action is requested.

Respectfully submitted,

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